WATER RESOURCES SIMULATION IN THE RIO GRANDE BASIN USING COUPLED MODELS

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As the demand for water resources in arid and semiarid regions grows, the effects of climate variability are magnified. Coupled models with high spatial and temporal resolutions provide an approach where increased accuracy is possible because feedback between atmosphere, surface and subsurface components is incorporated into the analyses and the effects of land use or regional impacts of climate variability on hydrologic response are more readily identified. Los Alamos National Laboratory is developing a coupled model of water resources in the Rio Grande Basin that considers the regional Rio Grande Basin in its global context.

The coupled model is composed of the Regional Atmospheric Modeling System (RAMS), a surface water hydrology model, a channel routing component, and subsurface flow model. RAMS provides the interface between global and regional climates and the meteorological variables and precipitation to the Simulator for Processes of Landscapes, Surface/Subsurface Hydrology (SPLASH). SPLASH partitions precipitation into evaporation, transpiration, soil water storage, surface runoff, and subsurface recharge. Surface and subsurface runoff is routed through a river channel model, and a subsurface hydrology model is linked to the land surface and channel flow components to simulate saturated and unsaturated flow and changes in the groundwater due to natural and anthropogenic effects.

Model structure, computational approach and data compiled to support model initialization and testing activities for the Rio Grande are described. Fundamental issues will be discussed such as nonlinear feedback between components and spatial and temporal scaling of processes. Simulations of the meteorology will be presented that demonstrate the effects of high spatial resolution simulations on the distribution of precipitation. Analyses of the surface runoff from the Rio Grande are given.

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